Claims

[c1] A method for compressing an intensity dynamic range of an input image to a reduced intensity dynamic range of an image display device, said method comprising:

defining a plurality of units of the input image;

determining a local mean estimate of an intensity of each of the plurality of units of the input image;

generating a contrast modification processing value for each local mean estimate; and

generating an output intensity value, for each local mean estimate, by using only the generated contrast modification processing value and an input intensity value.

[c2] A method in accordance with Claim 1 wherein defining a plurality of units comprises:

defining a plurality of units such that each unit corresponds to a pixel of the input image as detected by an image detector; and

defining a plurality of units such that each unit corresponds to an input intensity value that is at least one of a square-root encoded input intensity value and a linear encoded input intensity value.

[c3] A method in accordance with Claim 2 wherein generating a contrast modification processing value comprises:

generating a first value by multiplying a contrast modification function by a mean modification function;

generating a second value by dividing the first value by the local mean estimate; and

accessing a look-up table with reference to the second value and returning a contrast modification processing value.
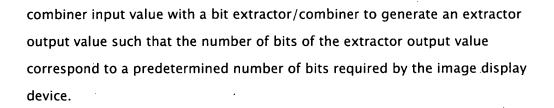
[c4] A method in accordance with Claim 3 further comprising multiplying the generated contrast modification processing value and an input intensity value to generate a combiner input value.

[c5] A method in accordance with Claim 4 further comprising processing the

combiner input value with a bit extractor/combiner to generate an extractor output value such that the number of bits of the extractor output value correspond to a predetermined number of bits required by the image display device.

[c6]   A method in accordance with Claim 2 wherein generating a contrast modification processing value comprises:
generating a first value by multiplying a contrast modification function by a mean modification function;
generating a second value by dividing the first value by the local mean estimate; and
generating a contrast modification processing value by determining the square-root of the second value.

[c7]   A method in accordance with Claim 6 further comprising multiplying the generated contrast modification processing value and an input intensity value to generate a combiner input value.

[c8]   A method in accordance with Claim 7 further comprising processing the combiner input value with a bit extractor/combiner to generate an extractor output value such that the number of bits of the extractor output value correspond to a predetermined number of bits.

[c9]   A method in accordance with Claim 8 further comprising squaring the extractor output value to generate a respective output intensity value within the reduced intensity range.

[c10]   A method in accordance with Claim 6 further comprising accessing a look-up table with reference to the square root of the second value and returning a contrast modification processing value.

[c11]   A method in accordance with Claim 9 further comprising accessing a look-up table with reference to the extractor output value and returning a respective output intensity value within the reduced intensity range.

[c12]
         A method for compressing an intensity dynamic range of an input image to a

reduced intensity dynamic range of an image display device, said method comprising:

defining a plurality of units of the input image such that each unit corresponds to a pixel of the input image as detected by an image detector and a scan line of an analog image detector;

determining a local mean estimate of an intensity of each of the plurality of units of the input image;

generating a contrast modification processing value for each local mean estimate by multiplying a contrast modification function by a mean modification function to generate a first value, dividing the first value by the local mean estimate to generate a second value, and accessing a look-up table with reference to the second value to generate a contrast modification processing value; and

generating an output intensity value, for each local mean estimate, by using only the generated contrast modification processing value and an input intensity value.

[c13] An apparatus for compressing an intensity dynamic range of an input image to a reduced intensity dynamic range of an image display device, said apparatus comprising:

an image detector; and

a computer coupled to said image detector and configured to:

define a plurality of units of the input image;

determine a local mean estimate of an intensity of each of the plurality of units of the input image;

generate a contrast modification processing value for each local mean estimate, and

generate an output intensity value, for each local mean estimate, by using only the generated contrast modification processing value and an input intensity value.

[c14] An apparatus in accordance with Claim 13 wherein to define a plurality of units, said computer further configured to:

define a plurality of units such that each unit corresponds to a pixel of the input

image as detected by an image detector; and

define a plurality of units such that each unit corresponds to an input intensity value that is at least one of a square-root encoded input intensity value and a linear encoded input intensity value.

[c15] An apparatus in accordance with Claim 14 wherein to generate a contrast modification processing value, said computer further configured to:

generate a first value by multiplying a contrast modification function by a mean modification function;

generate a second value by dividing the first value by a local mean estimate; and

access a look-up table with reference to the second value and return a contrast modification processing value.

[c16] An apparatus in accordance with Claim 15 wherein to generate a combiner input value, said computer further configured to multiply said generated contrast modification processing value by a input intensity value.

[c17] An apparatus in accordance with Claim 16 wherein to generate an extractor output value such that the number of bits of the extractor output value correspond to a predetermined number of bits required by the image display device. said computer further configured to process said combiner input value with a bit extractor/combiner.

[c18] An apparatus in accordance with Claim 14 wherein to generate a contrast modification processing value, said computer further configured to:

generate a first value by multiplying a contrast modification function by a mean modification function;

generate a second value by dividing the first value by a local mean estimate; and

generate a contrast modification processing value by determining the square-root of the second value.

[c19]

An apparatus in accordance with Claim 18 wherein to generate a combiner input value, for each local mean estimate, said computer further configured to

mulitply said generated contrast modification processing value by a square-root encoded input intensity value.

[c20]   20. An apparatus in accordance with Claim 19 wherein to generate an extractor output value such that the number of bits of the extractor output value correspond to a predetermined number of bits required by the image display device, said computer further configured to process the combiner input value with a bit extractor/combiner.

[c21]   An apparatus in accordance with Claim 20 wherein to generate a respective output intensity value within the reduced intensity range, said computer further configured to square said extractor output value.

[c22]   An apparatus in accordance with Claim 18 wherein to return said contrast modification processing value, said computer further configured to access a look-up table with reference to the square root of the second value.

[c23]   An apparatus in accordance with Claim 21 wherein to return a respective output intensity value within the reduced intensity range, said computer further configured to access a look-up table with reference to the extractor output value.

[c24]   A computer readable medium encoded with a program executable by a computer for compressing an intensity dynamic range of an input image to a reduced intensity dynamic range of an image display device, said program configured to instruct the computer to:
define a plurality of units of the input image;
determine a local mean estimate of an intensity of each of the plurality of units of the input image;
generate a contrast modification processing value for each local mean estimate, and
generate an output intensity value, for each local mean estimate, by using only the generated contrast modification processing value and an input intensity value.
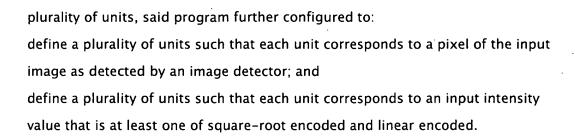
[c25]   A computer readable medium in accordance with Claim 24 wherein to define a

plurality of units, said program further configured to:

define a plurality of units such that each unit corresponds to a pixel of the input image as detected by an image detector; and

define a plurality of units such that each unit corresponds to an input intensity value that is at least one of square-root encoded and linear encoded.

[c26]   A computer readable medium in accordance with Claim 24 wherein to generate a contrast modification processing value, said program further configured to:

generate a first value by multiplying a contrast modification function by a mean modification function;

generate a second value by dividing the first value by a local mean estimate; and

access a look-up table with reference to the second value and return a contrast modification processing value.

[c27]   A computer readable medium in accordance with Claim 24 wherein to generate a combiner input value, said program further configured to multiply the generated contrast modification processing value by an input intensity value.

[c28]   A computer readable medium in accordance with Claim 24 wherein to generate an extractor output value such that the number of bits of the extractor output value correspond to a predetermined number of bits required by the image display device said computer further configured to process the combiner input value with a bit extractor/combiner.

[c29]   A computer readable medium in accordance with Claim 24 wherein to generate a contrast modification processing value, said program further configured to:

generate a first value by multiplying a contrast modification function by a mean modification function;
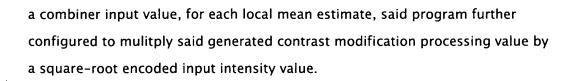
generate a second value by dividing the first value by a local mean estimate; and

generate a contrast modification processing value by determining the square-root of the second value.

[c30]

A computer readable medium in accordance with Claim 29 wherein to generate

a combiner input value, for each local mean estimate, said program further configured to mulitply said generated contrast modification processing value by a square-root encoded input intensity value.

[c31]   A computer readable medium in accordance with Claim 30 wherein to generate an extractor output value such that the number of bits of the extractor output value correspond to a predetermined number of bits required by the image display device, said computer further configured to process the combiner input value with a bit extractor/combiner.

[c32]   A computer readable medium in accordance with Claim 31 wherein to generate a respective output intensity value within the reduced intensity range, said program further configured to square said extractor output value.

[c33]   A computer readable medium in accordance with Claim 30 wherein to return a contrast modification processing value, said program further configured to access a look-up table with reference to the square root of the second value.

[c34]   A computer readable medium in accordance with Claim 32 wherein to return a respective output intensity value within the reduced intensity range, said program further configured to access a look-up table with reference to the extractor output value.

[c35]   A method for compressing an intensity dynamic range of an input image to a reduced intensity dynamic range of an image display device, said method comprising:
defining a plurality of units of the input image;
determining a local mean estimate of an intensity of each of the plurality of units of the input image using a morphological filter;
generating a contrast modification processing value for each local mean estimate, and
generating an output intensity value, for each local mean estimate, by using the generated contrast modification processing value and an input intensity value.

[c36]   A method according to Claim 35 wherein generating an output intensity value comprises generating an output intensity value, for each local mean estimate,

by using only the generated contrast modification processing value and an input intensity value.

[c37]   A method for compressing an intensity dynamic range of an input image to a reduced intensity dynamic range of an image display device, said method comprising:

defining a plurality of units of the input image;

determining a local mean estimate of an intensity of each of the plurality of units of the input image;

generating a contrast gain value for each local mean estimate using a sigmoid look-up table, and

generating an output intensity value, for each local mean estimate, by using the generated contrast gain value and an input intensity value.